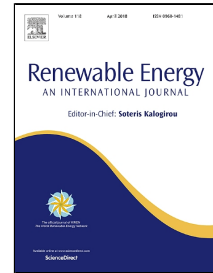


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A new optimization algorithm for solving wind turbine placement problem: Binary artificial algae algorithm

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Abstract

The wind turbine has grown out to be one of the most common renewable energy sources around the world in recent years. As wind energy becomes more important, the significance of wind turbine placement also increases. This study was intended to position the wind turbines on a wind farm to achieve the highest performance possible. The turbine placement operation was designed for a 2km×2km area. The surface of the area was calculated by dividing it into a 10×10 grid and a 20×20 grid with the use of binary coding. The calculation revealed ten different new binary algorithms using ten different transfer functions of the Artificial Algae Algorithm (AAA) that has been successfully applied to solve continuous optimization problems. These algorithms were applied to the turbine placement problem, and the algorithm that obtained the best result was called the Binary Artificial Algorithm (BinAAA). The results of the proposed algorithm for the binary turbine placement optimization problem were compared with those of other well-known algorithms in the relevant literature. The algorithm that was proposed in the study is an efficient algorithm for the placement problem of wind turbines since it optimized the binary search space and achieved the most successful result.

Keywords: Artificial Algae Algorithm, optimization, renewable energy, wind turbine placement problem

1. Introduction

Wind is one of the most promising alternative energy sources. It has become the most inclusive renewable energy source anywhere in the world [1]. Renewable energy systems are environmentally friendly, consistent, stable and economical [2]. Ocean, geothermal, solar, wind and hydroelectric are natural energy sources [3]. Wind power is the most significant one among these sources regarding energy production, and it can be converted into electricity with high efficiency. Wind is also a very profitable renewable energy source that can help meet current and future electricity demand [4]. Therefore, wind turbine systems are necessary. Wind turbines can

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